

## **SECTION 13091**

### **SHIELDING BLOCKS**

#### **PART 1 - GENERAL**

##### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

##### **1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Recycled Shielding Blocks.

##### **1.3 SUBMITTALS**

- A. Product Data: For the following:
  - 1. Paint products.
  - 2. Enclosure.
  - 3. Hoist Rings.
- B. Shop Drawings: Detail fabrication drawings showing dimensions and lift inserts for each block.
- C. Block Lift Plan: Submit a lift plan and procedure for approval for off loading the shield blocks at the SNS storage site 30 days prior to shipment of the first blocks.
- D. Shield Block Documentation: Submit six (6) copies for each shield block.
- E. Enclosure details, including materials of construction, fire rating, anchorage system, and a description of installation requirements of the first shipment of blocks.
- F. Enclosure Lift Plans: Submit a lift plan and procedure for lifting the enclosure when gaining access to the shield block storage stacking pad. Submit the plan for approval two weeks prior to the first scheduled delivery of any shield blocks.

##### **1.4 QUALITY ASSURANCE**

- A. Fabricator Qualifications: Fabricator shall be approved by the Department of Energy (DOE) as a supplier of low level radiation shielding blocks.

##### **1.5 PERFORMANCE REQUIREMENTS**

- A. Radiation Levels, Radionuclide Content:
  - 1. Dose rate at 12" shall not exceed 2.0 mrem/h.
  - 2. Block total radionuclide concentrations shall be below 2nCi/gm total.
- B. Lift Connection Pull Test:
  - 1. Both lifting positions shall be tested at 300% load. Lifting insert shall show no permanent deformation upon completion of the test.

## 1.6 DOCUMENTATION

- A. Each block shall be marked with a unique serial number stamped into the metal. The block number will indicate the serial and heat number. Each block will be shipped with the following information.
  - 1. Shield Block quality control (QC) checklist.
  - 2. Radiation survey report for the block.
  - 3. Alloy composition of the heat that the block is cast from.
  - 4. Detectable radionuclide summary (minimum detection limits shall be at or below concentrations specified in section 1.5).
  - 5. Pull test documentation as specified in section 1.5.

## PART 2 - PRODUCTS

### 2.1 MATERIALS AND PHYSICAL PROPERTIES

- A. Shield Block materials shall consist primarily of iron from recycled metals.
- B. Shield Blocks will have a minimum density of 425 pounds per cubic foot. The average density shall be calculated for each block by calculating the actual gross volume of each block and then deducting the volume of the lifting holes. This volume will then be divided into the actual block weight to determine the density. Blocks that fall below the minimum density will be rejected.

### 2.2 TOLERANCES AND SURFACE FINISH

- A. The blocks nominal dimensions will be 52 1/4 inch x 52 1/4 inch x 26 1/4 inch with a nominal weight of 19,200 pounds and 26 1/4 inch x 26 1/4 inch x 13 1/4 inch with a nominal weight of 2,300 pounds. Tolerances are plus and minus 0.50 inch of nominal block dimensions. The blocks shall be provided by Duratek, Oak Ridge, TN.
- B. Each block shall have 3 lifting devices on the block, which enables the block to be lifted in a flat or edge condition.
- C. The surface of the casting shall be free from loose or fused slag. Runners, risers, fins, and other cast-on pieces shall be ground flat.

### 2.3 ALLOWABLE FEATURES

- A. The following features are allowed, whether individual or in combination.
  - 1. Cracks:
    - a. Width: 0.19 inches maximum.
    - b. Depth: 4 inches maximum. Crack depth is measured externally at the two perpendicular surfaces and internally with a standard, flexible steel machinist rule.
    - c. Length: Full length of the block.
    - d. Repair: Weld crack closed when width exceeds 0.19 inches.
  - 2. Depressions: Depth: 1 inch maximum; Location: less than or equal to 4 inches from edge.
- B. Riser Connection: When the riser connection freezes and creates a void or hole in the block, the hole shall be filled with either iron alloys or copper metal.

## 2.4 HOIST RINGS

- A. If threaded inserts are used to lift the blocks, then hoist rings shall be provided as manufactured by Jergens Inc, Cleveland, Ohio, part number 23433, center pull type, 1 1/2 - 6 thread size, with a load capacity of 24 kips and a 5:1 safety factor. Provide 8 hoist rings to the Construction Manager.

## 2.5 STORAGE ENCLOSURE

- A. All blocks shall be stored in an area designated by Construction Manager.
- B. The seller shall provide and install, at no additional cost, an enclosure that protects the blocks from weather, including rain, snow, sun, and other weather phenomenon. The enclosure shall be durable to the extent that it will provide shelter from weather elements for a minimum of four years. The enclosure shall be one piece and shall be capable of being lifted in and out of place to allow future block deliveries.
- C. The enclosures shall have a covering made of high strength PVC-coated polyester, which is at least 21 oz./sq. yd. Resistant to UV light and certified by an independent lab to meet NFPA 701 (flame retardant and self-extinguishing). The roof must be made of the same material, but translucent. Roof must be self-supporting without need for footings and capable of withstanding snow loads in excess of 10 lbs./sq. ft. The enclosure must be capable of being moved in erect form using a boom crane.
- D. On site assembly of the enclosure must be by hand tools with no cutting, burning, or welding required.
- E. The enclosure shall be anchored down to resist wind loads. The anchorage system may utilize shield blocks if feasible.
- F. The enclosure shall have one 3' 0" X 7' 0" door for access into the structure and may be fixed or removable. If a removable structure is used, it must maintain its shelter characteristics during use. The seller will be responsible for inspecting and assuring the integrity of the structure each time it is moved and replaced. Any repairs necessary to maintain the structure will be the responsibility of the seller.
  - 1. The enclosure shall be placed over the blocks within two weeks of storage maximization or when a three months lapse in deliveries is anticipated.

## PART 3 - EXECUTION

### 3.1 INSPECTION

- A. Each block delivered to the site shall be inspected by the Construction Manager's designated representative. Inspection shall consist of a radiation level survey, physical inspection of each block for compliance with the specification requirements, and a review of all documentation. Inspection of the blocks may be performed at the seller's facility prior to shipment. Block paint inspection per Section 3.2 will be the final acceptance inspection for the blocks.

### 3.2 PAINTING

- A. There shall be no removable surface contamination prior to painting. All blocks shall receive a primer and finish coat of water based lead-free enamel paint. The paint will be applied in accordance with Duratek shield block painting practices and the two coats shall be of different colors. Blocks not deemed adequately painted will be rejected at the seller's

site. The blocks shall be inspected at the final destination and any blocks found to have suffered paint damage during shipping will be touched up by the seller.

### 3.3 TRANSPORTATION

- A. Transportation of the shield blocks to the SNS project shall be the responsibility of the seller and shall meet the transportation requirements of all the federal and state agencies. The seller shall deliver the shield blocks at a quantity and time mutually agreeable to the seller and Construction Manager. The seller shall provide all equipment and personnel necessary for the delivery, off loading and stacking of the shield blocks at the SNS designated site.

**END OF SECTION 13091**